Serial Number	09/826,117	04/22/2005
Filing Date	01/09/2001	
Name	Urbain A. von der Embse	
Unit	2667	
Examiner	Rhonda L. Murphy	

REMARKS

The amended patent documents "Specification Amendments", "Claim Amendments", and the "Drawing Amendments" have been written to conform to the received "Notice of Non-Compliant Amendment (37 CFR 1.121)".

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DRAWING AMENDMENTS

List and explanation of drawing amendments to application 09/826,117

The original drawings are unchanged and supplementary drawings have been added when necessary to help explain the originals.

FIG.1A in the amendment drawings is FIG. 1 in the original submittal. FIG. 1B, 1C are added to help explain FIG. 1A.

FIG. 2 is unchanged.

FIG. 3A in the amendment drawings is FIG. 3 in the original submittal. FIG. 3B is added to help explain FIG. 3A.

FIG. 4 is unchanged.

FIG. 5 is unchanged.

FIG. 6A in the amendment drawings is FIG. 6 in the original submittal. FIG. 6B,6C,6D are added to help explain FIG. 3A.

FIG. 7A in the amendment drawings is FIG. 7 in the original submittal. FIG. 7B is added to help explain FIG. 7A.

Drawing amendments to application 09/826,117

This title page with the amended name of the patent application is new.

APPLICATION NO.	09/826,117
INVENTION	Hybrid Walsh encoder and decoder for CDMA
INVENTOR	Urbain Alfred von der Embse

DRAWINGS AND PERFORMANCE DATA

FIG.1A in the amendment drawings is FIG. 1 in the original submittal.

APPLICATION NO. 09/826,117

TITLE OF INVENTION: ~~Complex~~ Hybrid Walsh encoder and decoder ~~Codes~~ for CDMA

INVENTOR: Urbain A. von der Embse

CLAIMS

WHAT IS CLAIMED IS:

~~1. A means for the design of new complex Walsh orthogonal CDMA encoding and decoding over a frequency band with properties~~

~~provide a complex Walsh orthogonal code with the real component equal to the real Walsh orthogonal code~~

~~provide a complex Walsh orthogonal code with the imaginary component equal to a reordering of the real Walsh orthogonal code, which makes the complex Walsh orthogonal code the correct complex version of the real Walsh orthogonal code to within arbitrary angle rotations and scale factors~~

~~provide a complex Walsh orthogonal code which is in correspondence with the discrete Fourier transform (DFT) complex orthogonal codes wherein the correspondence is twofold: the sequency of the complex Walsh orthogonal codes is the average rate of rotation of the complex Walsh codes and corresponds to the frequency of the DFT codes with sequency as well as frequency increasing with the code numbering, and the second correspondence is between the even and odd complex Walsh code vectors and the cosine and sine DFT code vectors respectively~~

~~provide a complex Walsh orthogonal code which has the sign values +/-1 +/-j for the real and imaginary axes~~

~~provide a complex Walsh orthogonal code which has a fast decoding algorithm~~

~~provide a hybrid complex Walsh orthogonal code which can be constructed for a wide range of code lengths by combining the complex Walsh codes with DFT complex orthogonal codes~~

~~2. A means for the design of new complex Walsh orthogonal CDMA codes with the properties~~

~~provide complex Walsh orthogonal CDMA codes which reduce to the real Walsh orthogonal CDMA codes upon removal of the complex code components~~

~~provide complex Walsh orthogonal CDMA codes which reduce to the real Walsh orthogonal CDMA codes upon removal of the real code components~~

~~provide a means for the computational efficient encoding and decoding of the complex Walsh orthogonal CDMA codes~~

~~3. A means for the design of new complex Walsh orthogonal CDMA codes with the properties~~

~~provide the correct generalization of the real Walsh orthogonal CDMA codes to the complex Walsh orthogonal CDMA codes~~

~~provide a computationally efficient means to encode and decode the complex Walsh orthogonal CDMA codes~~

~~provide a means to extend the complex Walsh orthogonal CDMA codes to include the complex discrete Fourier transform (DFT) codes to allow greater flexibility in the choices for the code lengths~~

~~4. A means for the design of hybrid complex Walsh orthogonal CDMA codes with the properties~~

~~provide a means to provide greater flexibility in the selection of the code length by combining the complex Walsh orthogonal CDMA codes with the complex DFT orthogonal CDMA codes~~

~~provide a Kronecker product means to combine the complex Walsh orthogonal CDMA codes with the complex DFT orthogonal CDMA codes~~

~~provide a direct sum means to combine the complex Walsh orthogonal CDMA codes with complex DFT orthogonal CDMA codes as well as other complex Walsh orthogonal CDMA codes~~

~~provide a functionality means to combine the complex Walsh orthogonal CDMA codes with the complex DFT orthogonal CDMA codes~~

~~5. A means for the design of 4-phase Walsh orthogonal CDMA codes with the properties~~

~~provide 4-phase Walsh orthogonal CDMA codes which can be reduced to the 2-phase real Walsh orthogonal CDMA codes~~

~~provide 4-phase Walsh orthogonal CDMA codes which are the correct generalization of the 2-phase real Walsh orthogonal CDMA codes to 4-phases~~

~~provide hybrid Walsh orthogonal CDMA codes by combining the 4-phase Walsh orthogonal codes with the N-phase DFT codes with greater flexibility in the choice of the code length~~

~~6. A means for the design of 4-phase Walsh orthogonal CDMA codes with the properties~~

~~provide 4-phase Walsh orthogonal CDMA codes in the code space C^N which include the 2-phase real Walsh orthogonal CDMA codes in R^N~~

~~provide 4-phase Walsh orthogonal CDMA codes which have computationally efficient encoding and decoding implementation algorithms~~

7. A means for the design and implementation of encoders and decoders for Hybrid Walsh complex orthogonal CDMA channelization codes over a frequency band with properties

inphase (real) codes are equal to a lexicographic reordering permutation of the Walsh code

quadrature (imaginary) codes are equal to a lexicographic reordering permutation of the Walsh code

codes have a 1-to-1 sequency~frequency correspondence with the DFT codes

codes have 1-to-1 even~cosine and odd~sine correspondences with the DFT codes

codes take values {1+j, -1+j, -1-j, 1-j}

codes take values {1, j, -1, -j} with a (-45) rotation of axes and a renormalization

codes have fast encoding and fast decoding algorithms

encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes

decoders are implemented in CDMA receivers for representative embodiments as complex conjugate transpose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and

quadrature encoded data, after decovering by short and long complex PN codes

8. A means for the design and implementation of encoders and decoders for generalized Hybrid Walsh complex orthogonal CDMA channelization codes over a frequency band with properties

codes can be constructed for a wide range of code lengths by combining with DFT and quasi-orthogonal PN codes using tensor product, direct product, and functional combining

codes can be constructed as tensor products with DFT codes and quasi-orthogonal PN codes and other codes

codes can be constructed as direct products with DFT codes and quasi-orthogonal PN codes and other codes and with functional combining

codes are complex valued

codes have fast encoding and fast decoding algorithms

encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes

decoders are implemented in CDMA receivers for representative embodiments as complex conjugate transpose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes

9. A means for the design and implementation of encoders and decoders for complex orthogonal CDMA channelization codes over a frequency band with properties

inphase (real) codes are equal to a reordering permutation of the Walsh code

quadrature (imaginary) codes are equal to a reordering permutation of the Walsh code

codes are complex valued

codes have fast encoding and fast decoding algorithms

encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes

decoders are implemented in CDMA receivers for representative embodiments as complex conjugate tanspose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes

10. A means for the design and implementation of encoders and decoders for generalized complex orthogonal CDMA channelization codes over a frequency band with properties

codes can be constructed for a wide range of code lengths by combining with DFT and quasi-orthogonal PN codes using tensor product, direct product, and functional combining

codes can be constructed as tensor products with DFT codes and quasi-orthogonal PN codes and other codes

codes can be constructed as direct products with DFT codes and quasi-orthogonal PN codes and other codes and with functional combining

codes are complex valued

codes have fast encoding and fast decoding algorithms

encoders are implemented in CDMA transmitters for representative embodiments as complex multiply channelization encoding of the inphase and quadrature data replacing the Walsh real multiply channelization encoding of the inphase and quadrature data, prior to covering by long and short complex PN codes

decoders are implemented in CDMA receivers for representative embodiments as complex conjugate transpose multiply decoding of the inphase and quadrature encoded data replacing the Walsh real multiply decoding of the inphase and quadrature encoded data, after decovering by short and long complex PN codes